

**Abstract of the Disclosure**

According to the invention, a magnetic field gradiometer detector for detecting a material of interest positioned in a detecting region outside the detector includes a transmitter for generating an output signal at a selected frequency, a receiver for detecting the signal, a probe, and a switch coupling the receiver and transmitter with the probe that alternately connects and disconnects the receiver and transmitter to the probe, switching between transmitting and receiving. The probe includes tuning elements and a gradiometer coil array. The gradiometer coil array includes a first surface coil and a second surface coil wound in an opposite sense, the probe having a first side and an opposite second side, with the first and second surface coils configured asymmetrically such that the probe projects a magnetic field in the outside detecting region adjacent to the first side while being self-shielded on the second side. Accordingly, the material of interest is detected with increased sensitivity and accuracy in the detecting region with the detector shielded from outside RF sources.